I CLAIM:

1. Methods of operating surface reactors comprising in each method the steps of:

providing a reactor body having a reactor surface);

feeding a first reactant to the reactor surface from a first entry location so that the reactant spreads out on the surface in the form of a first thin film);

feeding a second reactant to the reactor surface from a second entry location so that the reactants can interact in a reaction zone on the reaction surface; and

collecting the product of the interacting reactants at an outlet location;

wherein the reactor body provides a retaining surface closely spaced from the reactor surface so as to form between them a reaction passage providing a reaction zone between the second entry location and the outlet location and through which the reactants fed to the reactor surface will pass while reacting with one another, the reactor and retaining surfaces being movable relative to one another to apply shear between them to reactants passing in the reaction passage; and

wherein each reactant after the first is fed to the reactor surface in the form of a respective thin film that is fed into a respective preceding thin film or combination of thin films, each thin film at its entry to the reaction passage immediately being subjected at its intersection with the preceding thin film or combination of thin films to continuous and uniform shear, the shear rate being such as to disrupt molecular clusters in the thin films and thereby permit the molecules of the thin films to aggressively react with one another to form the resultant product.

2. A method as claimed in claim 1, wherein the reactor surface is a surface of a disk spinning about a rotation axis; and

wherein shear in the reaction passage is transverse to the direction of the flow of reactants in the passage and is produced by relative rotation between the moving reaction surface and the retaining surface which is stationary.

3. A method as claimed in claim 1, wherein the thickness of each of the thin films is between 5 and 500 micrometers.

4. A method as claimed in claim 1, wherein the thickness dimension of the reaction chamber can be varied and is less than 1.00 mm (0.04 in).

5. A method as claimed in claim 1, wherein each thin film after the first thin film is fed vertically to the reactor surface into the first thin film or combination of thin films that precedes it.

6. A method as claimed in claim 1, wherein the shear in the interacting reactants is increased by introduction of a pressurized gaseous component into the reaction passage.

7. A method as claimed in claim 2, wherein each thin film after the first thin film is fed to that thin film or to a subsequent mixture of thin films at an entry location spaced at a radial distance from the rotation axis such as to provide the shear required to ensure disruption of molecular clusters in the reacting reactants.

8. A method as claimed in claim 2, wherein the thickness of each of the thin films is between 5 and 500 micrometers.

9. A method as claimed in claim 2, wherein the thickness dimension of the reaction chamber can be varied and is less than 1.00 mm (0.04 in).

10. A method as claimed in claim 2, wherein each thin film after the first thin film is fed vertically to the reactor surface into the first thin film or combination of thin films that precedes it.

11. A method as claimed in claim 2, wherein each thin film is fed into the thin film that receives it through a respective annular nozzle producing a respective thin film directed at the reactor surface.

12. A surface reactor comprising:

a reactor body having a reactor surface;

means for feeding a first reactant to the reactor surface from a first entry location so that the reactant spreads out on the reactor surface in the form of a first thin film;

means for feeding a second reactant to the reactor surface from a second entry location so that the reactants can interact in a reaction zone on the reactor surface; and

means for collecting the product of the interacting reactants at an outlet location;

wherein the reactor body provides a retaining surface closely spaced from the reactor surface so as to form between them a reaction passage providing a reaction zone between the second entry location and the outlet location and through which the reactants fed to the reactor surface will pass while reacting with one another, the surfaces being movable relative to one another to apply shear between them to reactants passing in the reaction passage; and

wherein each reactant after the first reactant is fed to the reactor surface in the form of a respective thin film that is fed into a respective preceding thin film or combination of thin films, each thin film at its entry to the reaction passage immediately being subjected at its intersection with the preceding thin film or combination of thin films to continuous and uniform shear therein, the shear rate being such as to disrupt molecular clusters in the thin films and thereby permit the molecules of the thin films to aggressively react bond with one another to form the resultant product.

13. A surface reactor as claimed in claim 12, wherein the reactor surface is a surface of a disk spinning about a rotation axis; and

wherein shear in the reaction passage is transverse to the direction of the flow of reactants in the passage and is produced by relative rotation between the moving reaction surface and the retaining surface which is stationary.

14. A surface reactor as claimed in claim 12, wherein at each entry location the respective reactant is fed in the form of a thin film of thickness between 5 and 500 micrometers.

15. A surface reactor as claimed in claim 12, wherein the reactor comprises means whereby the thickness dimension of the reaction passage can be varied, and the thickness dimension is less than 1.00 mm (0.04 in).

16. A surface reactor as claimed in claim 12, wherein the means feeding each thin film after the first thin film to the reactor surface is fed vertically to the reactor surface into the first thin film or combination of thin films that precedes it.

17. A surface reactor as claimed in claim 13, wherein at each entry location the respective reactant is fed in the form of a thin film of thickness between 5 and 500 micrometers.

18. A surface reactor as claimed in claim 13, wherein the reactor comprises means whereby the thickness dimension of the reaction passage can be varied, and the thickness dimension is less than 1.00 mm (0.04 in).

19. A surface reactor as claimed in claim 13, wherein the means feeding each thin film after the first thin film to the reactor surface is fed vertically to the reactor surface into the first thin film or combination of thin films that precedes it.

20. A surface reactor as claimed in claim 13, wherein each thin film after the first film is fed into the film that receives it through a respective annular nozzle producing a respective thin film directed at the reactor surface.